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A SIMPLE STEAM STERILIZER FOR FARM DAIRY UTENSILS

S. HENRY AYERS

Bacteriologist, and

GEORGE B. TAYLOR

Market Milk Specialist, Dairy Division

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STERILIZATION of dairy utensils is necessary for the production of dairy products of high quality, particularly milk and cream, because the washing of dairy utensils, at least, by the process ordinarily used, is not sufficient to insure freedom from infection and contamination.

Dairy utensils on small farms are not often sterilized efficiently, because steam is not available. The sterilizers now in use require small boilers, and the whole sterilizing outfit often is regarded as too expensive to use, especially on farms where only a few cows are milked.

This bulletin describes a simple and inexpensive, yet efficient, steam sterilizer which can be provided at a cost of from \$10 to \$15 complete with kerosene stove. This is considered low enough to justify its use on any farm from which milk or cream is sold. The additional keeping quality which the sterilization of utensils will give milk and cream probably will pay for the cost of the sterilizer in one season.

Details of the construction of the sterilizer and the method of using it also are explained.

A SIMPLE STEAM STERILIZER FOR FARM DAIRY UTENSILS.

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NECESSITY OF STERILIZING DAIRY UTENSILS.

DIRTY dairy utensils, and even those which apparently are clean but which have not been sterilized, contain vast numbers of bacteria which are added to milk or cream when it comes into contact with them. These bacteria when introduced into milk begin to grow and produce changes which spoil it. It is true that even when milk is produced under clean conditions it will contain a few bacteria, for when such milk is placed in unsterilized utensils or is run through an unsterilized strainer cloth or separator, large numbers of bacteria are added, which are likely to spoil it quickly.

When dairy utensils are sterilized by steam, all bacteria and disease germs which may be upon them are destroyed, and therefore milk and cream when placed in these utensils will keep sweet much longer.

CONSTRUCTION OF THE STERILIZER.

The sterilizer described and recommended to the farmer is designed to be of greatest use to those who have one, two, or three 10-gallon or smaller cans with a similar number of pails and a strainer cloth. It can be used, however, with a larger number of cans.

The sterilizer consists of the parts shown in figure 1. First is a roasting pan (A) of standard size, 20 inches long, 14 inches wide (top measurement), and 3 inches deep. The upper part consists of a close-fitting insulated cover (B), upon which is placed the box (C), with its removable top (D). The cover is made as follows: Take

a sheet of heavy galvanized iron and cut it large enough to allow it to project three-quarters of an inch over the edge of the pan. Bend the edges of the sheet so as to form a shallow box with sides three-eighths of an inch high. Then cut out a cover for the shallow box. Cut a hole $1\frac{1}{2}$ inches in diameter in the center, through the top and the bottom, of the shallow box. Iron braces should be placed crosswise of the box to strengthen it. Then fill the shallow box completely with paper or asbestos sheets, after which the top is carefully soldered on, care being taken to make the seams absolutely tight. Solder a round, galvanized-iron pipe $4\frac{1}{2}$ inches long and $1\frac{1}{2}$ inches in diameter in the hole in the center of the cover. Solder flanges beneath the cover so that they will meet the edge of the roasting pan, thus making a tight cover. On the top of the insulated cover

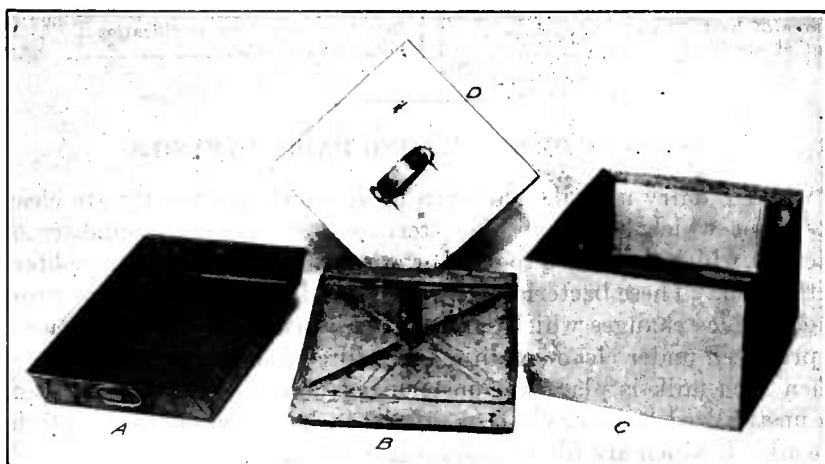


FIG. 1.—Parts of the steam sterilizer : A, Roasting pan ; B, cover of pan ; C, galvanized-iron box ; D, removable top of box.

solder strong folded galvanized-iron strips, three-eighths of an inch high, to form a square 15 inches by 15 inches, for holding the upper galvanized-iron box. On top of the cover solder also four strips of stiff, galvanized-iron 8 inches long and three-eighths of an inch wide. These strips should extend three-eighths of an inch above the cover and run from a distance of 1 inch from the corners to 1 inch from the steam outlet in the center.

The galvanized-iron box (C) with removable top (D), which has a handle, is shown in the figure. The box has no bottom but fits in the square formed by the four strips on the cover. The box is 11 inches high. Inside it, three-fourths of an inch from the top and one-half inch from one side, a stiff wire should be riveted and soldered, as shown in figure 1, where a strainer cloth may be seen hanging. It is sometimes desirable to reinforce the box (C) at each

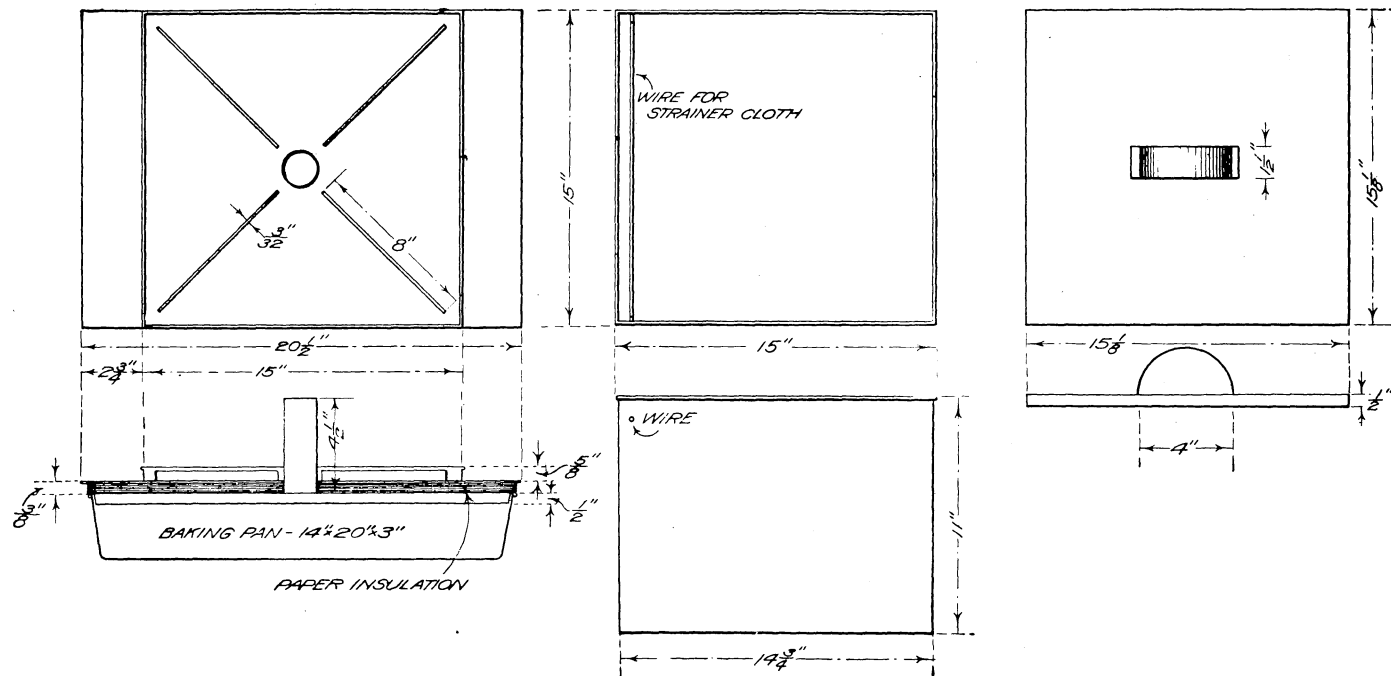


FIG. 2.—Dimension drawing of the parts of the sterilizer.

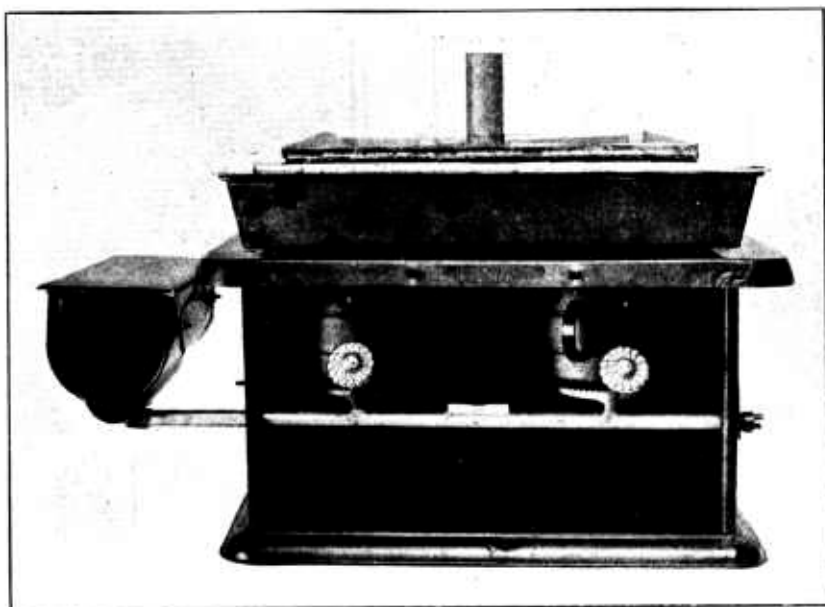


FIG. 3.—Sterilizer in position on oil stove to sterilize cans and pails.

corner with angle iron 6 inches long and one-half inch wide, riveted halfway up the side. The top of the box (D) should be made large enough to extend over the sides and fit closely. Figure 2 shows a dimension drawing of the parts of the sterilizer.

SOURCE OF HEAT.

In the department's tests of the outfit described a two-burner wickless kerosene stove was used with excellent results. The sterilizer, however, may be placed on the kitchen stove or over any other source of heat, such as a gas, gasoline, or laundry stove which burns either wood or coal. Good results are obtained at very little cost by building under the sterilizer a brick furnace 12 inches high. This furnace consists of a brick floor and walls of one width of brick, all tightly joined together with mortar. The ledge should be filled with mortar, and before it is set the roasting pan is placed in the mortar so that an impression is made. When the mortar is set, the pan will fit snugly. A small brick or stovepipe chimney should be constructed at the end of the furnace. It is necessary to have sufficient heat to furnish steam at the end of the outlet pipe at least 205° F., and 210° to 211° F. should be obtained if possible. The advantage of using a kerosene stove lies in the fact that a uniform supply of heat is pro-

vided. When the burners are burning properly, the temperature of the steam will be constant, and no attention need be given after the temperature has reached 205° F. When other sources of heat are used, temperature readings must be taken at frequent intervals to see that the steam is 205° F. or above.

COST OF STERILIZER.

The cost of the sterilizer itself should not be more than \$8. The roasting pan varies in price from 25 cents to \$1, depending on the grade of iron. The galvanized iron, with asbestos and construction work, should not cost more than \$7, and the work can be done by any tinner. A two-burner wickless kerosene stove costs from \$4 to \$5, but in many cases it will not be necessary to purchase a stove.

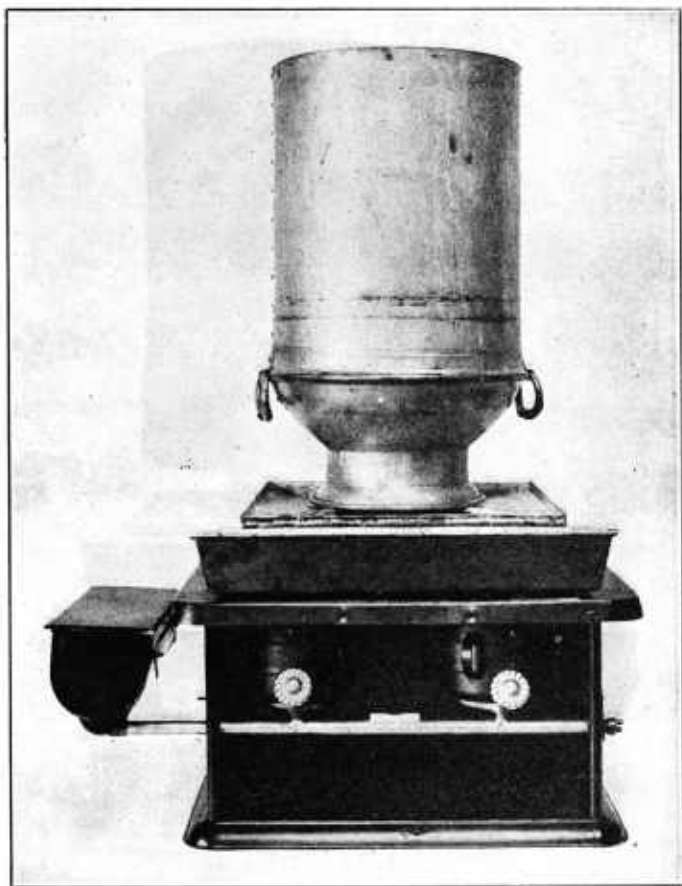


FIG. 4.—Can in position for sterilization.

METHOD OF OPERATING THE STERILIZER.**TO STERILIZE CANS.**

Fill the roasting pan with water to a depth of 1 inch. Fit the cover on the pan and place on a two-burner kerosene stove, as shown in figure 3. As soon as the water heats sufficiently, steam will come from the outlet pipe. The temperature of the steam at its first appearance is about 140° F. Continue the heating until the temperature of the steam at the end of the outlet pipe is at least 205° F.; this should be determined by a thermometer. When the steam has reached this temperature, place the can inverted over the steam outlet, as shown in figure 4, for five minutes, then remove, shake out any water, and place upright on the floor. The can should be absolutely

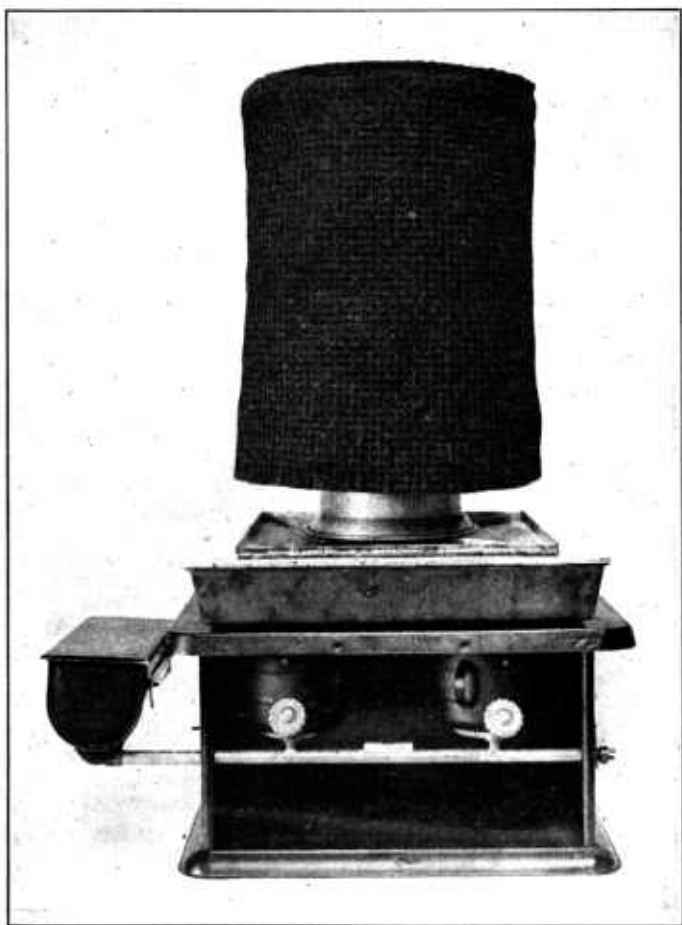


FIG. 5.—A form of insulating cover for cans.

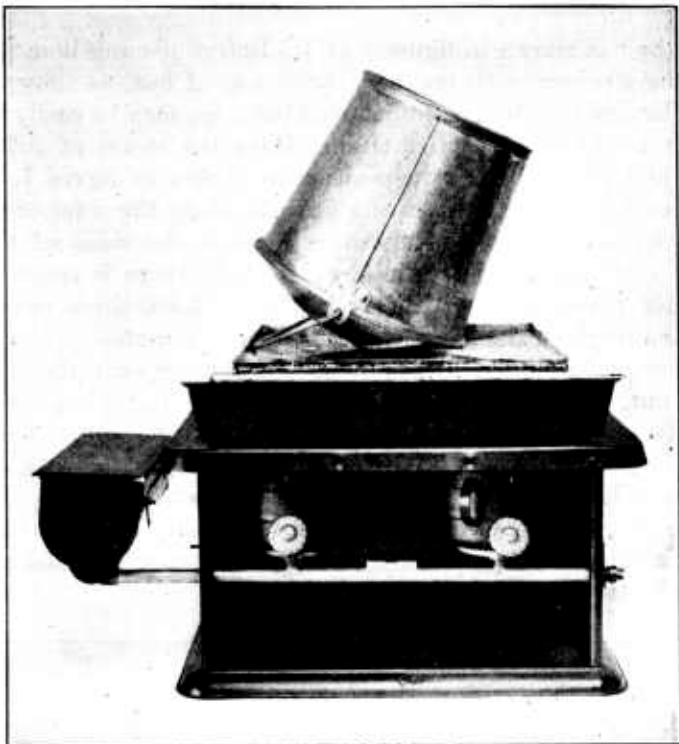


FIG. 6.—Milk pail in position for sterilization.

dry in two or three minutes. If not dry in that time it shows that the steam was not at 205° F. or above, or that the can had not been washed clean. On account of being so highly heated by the steam the can should dry almost immediately.

In figure 5 an insulating cover is shown over the can. A similar cover can be made cheaply from a blanket, and its use is urged, especially in cold rooms, since otherwise the can may be cooled so quickly that it will not dry thoroughly.

TO STERILIZE PAILS.

See that the steam is at a temperature of 205° F. or above, then place the pail inverted over the steam outlet, as shown in figure 6. Allow it to remain five minutes, then remove, shake out the water resulting from the condensed steam, and set upright on the floor. The pails do **not** dry so quickly as the cans, but they will be absolutely dry within a few minutes. An ~~insulating woolen cover is also recom-~~ mended for use in a cold room. After the pails have been steamed and are dry, place them upright in a clean, dry, covered wooden or metal box until milking time.

TO STERILIZE CAN COVERS AND STRAINER CLOTHS.

Use the box shown in figure 1 (C). Before placing it in position, hang the strainer cloth on the wire at top of box, as shown in the figure, having the cloth so folded that one edge may be easily reached without handling the entire cloth. Have the steam at 205° F. or above, and place the box in position as shown in figure 7, leaving the cover off. Set the can covers upright along the sides of the box inside, with the tops of the covers against the sides of the box. As one side is covered by the strainer cloth, there is space against the other three sides, giving room for at least three can covers. Place the cover on the box and steam for five minutes. Then remove the cover and take out the can covers, handling only the top edge. Shake out any water collected in the covers and place them, top down, on a table. It is important to observe this, so that the inside of the cover is uppermost. These covers will dry within two or three minutes, after which they should be placed tightly on the dry cans. Handle only the edge of the cover which remains outside of the can. The strainer cloth should remain hanging in place with the cover on the box until it is to be used at milking time.

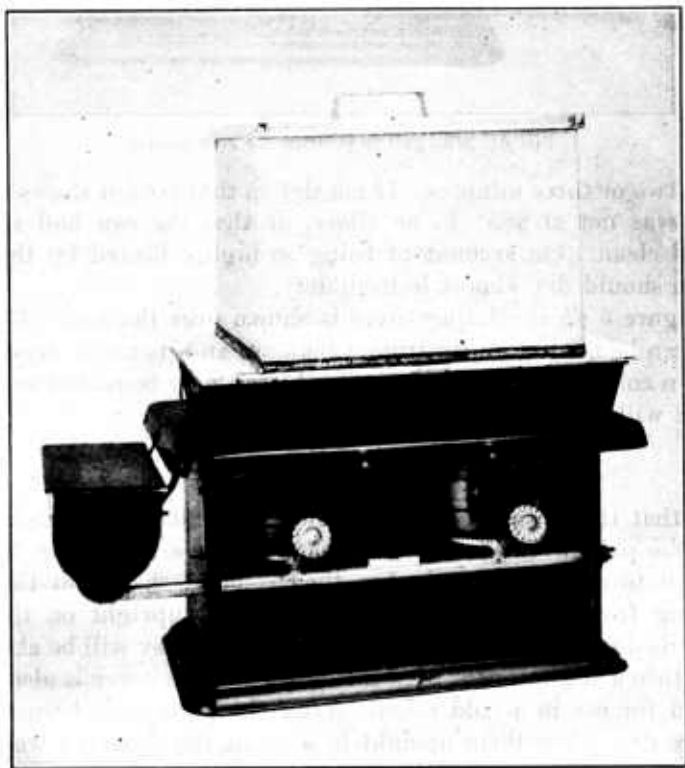


FIG. 7.—Box in position for sterilizing can covers and strainer cloth.

TO STERILIZE SEPARATOR PARTS.

The milk-receiving tank of the separator, the same as a milk pail, should be steamed five minutes while inverted over the steam outlet pipe. For other separator parts, use the box the same as for can covers. Wash the parts thoroughly, and when the temperature of the steam is 205° F. or above, place the box in position as shown in figure 7. Place the separator parts in the box and put the cover on. Allow to remain for five minutes. If the parts are too large for the box, a special case should be constructed. After steaming, keep the tank and separator parts in a clean place free from dust.

COST OF OPERATION.

The cost of operation for the sterilization of two 10-gallon cans, with tops, two pails, and strainer cloth, using kerosene at 10 cents a gallon, will be about eight-tenths of a cent. This cost is based on the following figures: Each burner consumes one-half pint of oil an hour, making a total of 1 pint of kerosene, which at 10 cents a gallon amounts to 1½ cents for fuel per hour. Starting with water at a temperature of 60° F. and with the water 1 inch deep in the roasting pan, about 12 minutes is required to heat the water and generate steam at a temperature of 205° F. Five minutes is then required for each can, the same for each pail, and the same for covers and strainer cloths. Thus the two cans require 10 minutes, the two pails the same, and the covers and strainer five minutes, making a total of 25 minutes, which added to the 12 minutes required to generate steam, makes a total of 37 minutes for the operation. In this operation no time has been allowed for changing utensils. Two minutes should be sufficient for these changes. To sterilize three cans with covers and strainers would therefore cost about 1 cent. When the sterilizer is used on the kitchen stove the cost should, of course, be very much less, if the stove were already in daily use.

RESULTS OBTAINED BY STERILIZATION.

When properly operated, this sterilizer destroys practically all the bacteria in the utensils, including all disease germs which may be present. It will accomplish the same results as any sterilizer in which steam not under pressure is used. Experiments with this sterilizer show that the 5-minute steaming is, for practical purposes, as good as the 15 to 30 minute steaming usually recommended.

POINTS TO REMEMBER.

1. Rinse utensils in cold water, then wash thoroughly with hot water and washing powder. Utensils must be washed clean before sterilization. Sterilization is not a substitute for washing.

2. One inch of water in the roasting pan will furnish steam at a temperature of 211° F. for about 50 minutes. If the sterilizer is operated for a longer period, water should be added to make up for loss by evaporation.

3. The temperature of the steam as it comes from the outlet pipe must be at least 205° F. and preferably 210° or 211° F.

4. When the sterilizer is not used on a kerosene stove, temperature readings must be taken frequently, to see that the temperature of the steam is 205° or above.

5. Cans, pails, covers, and strainer cloths must be steamed for a full 5-minute period. Longer steaming will do no harm, but is not necessary. The 5-minute period must be reckoned from the time the can is placed inverted over the steam outlet, and the steam must be at least 205° F. when the can is placed in position.

6. An accurate thermometer, with a scale reading to 212° F., is necessary to determine the temperature.

7. When a can or pail is placed over the steam outlet its top should rest on the four raised metal supports, shown in figure 1, (B), in order to keep it three-eighths of an inch above the surface of the pan. This is necessary to prevent the water from the condensed steam from sealing the opening below the can or pail. If this space is filled with water, steam will not enter the can.

8. No arrangement is provided for the water from condensed steam to run back into the roasting pan. This can be arranged if found desirable. When only a few utensils are to be sterilized the water can be soaked up with a towel if the quantity has become too great, or the whole cover may be lifted and the water allowed to run off.

9. Some form of insulation is recommended for use over utensils which are being sterilized in a cold room. A blanket easily can be made for this purpose. This is desirable in order to keep the cans or pails hot long enough after sterilization to dry out quickly.

10. Cans should be dry in two or three minutes after removal when placed upright. If they do not dry within that time, they have not been heated sufficiently or were not washed clean.

11. The drying of dairy utensils after washing and sterilization is extremely important, for bacteria may develop in a moist can.

12. After the utensils are sterilized and dried, they should be placed in a room free from dust and should not be touched until milk is placed in them. Pails after steaming and drying should be placed upright in a clean, dry, covered wooden or metal box, where they should remain until milking time.

13. The sterilizer has been designed with the intent of making it both cheap and simple, to give the desired results. Satisfactory results should follow its use.

14. When using a kerosene or gasoline stove the sterilizing should be done in a room where milk is not handled, as the milk may absorb the odor of the oil.

15. The sterilizer may be used advantageously for separator parts, which should be steamed in the box used for can tops. In case they do not fit, a special metal box should be made.

16. After use, the parts of the sterilizer, especially the roasting pan and cover, should be cleaned and wiped dry, to prevent rusting.

17. The sterilization of dairy utensils is a matter of very great importance, and producers are urged, for their own advantage, to prevent the introduction of vast numbers of bacteria into their milk from unsterilized utensils which may look clean to the eye. Under ordinary circumstances bacteria grow rapidly in milk and spoil it, thereby causing losses to the producer and others.

The Dairy Division of the Bureau of Animal Industry, United States Department of Agriculture, will be glad at any time to answer questions regarding the construction and operation of this sterilizer.

18. The sterilizer described herein should be built exactly according to specifications in order to attain the satisfactory results claimed.

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